Docket No. 032700-2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| In re Patent Application of: | ) | Confirmation No. 3047 |
| Timo AILA et al. | ) | Group Art Unit: 2671 |
| Serial No. 10/757,547 | ) | Examiner: Jason Michael Repko |
| Filed: January 15, 2004 | ) | |
| For: OCCLUSION CULLING METHOD | ) | Date: October 10, 2006 |

**REQUEST FOR RECONSIDERATION**

**MAIL STOP AF**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action dated June 7, 2006, Applicants respectfully request reconsideration and withdrawal of the rejections of the claims.

In the final Office Action, the Examiner maintained the rejection of claims 1-5, 7-12 and 14-18 under 35 U.S.C. §102(e), as allegedly being anticipated by the Xie et al. patent. In response to Applicants' arguments presented in the March 28, 2006, response, where in the paragraph spanning pages 8 to 9 it was pointed out in detail why the two-pass rendering method described Xie et al. basically comprises parts of a same test, the Examiner asserts that Xie et al. nevertheless describes a first visibility test and a second visibility test because each test indicates the visibility of computed and collected primitives. It is respectfully submitted, however, that Xie et al. cannot anticipate the claimed subject matter because there exists fundamental differences between the claimed subjection matter and Xie et al., as will now be described:

The present application describes a first visibility test, which is performed just after the Geometry processor output (e.g., see Figure 2, items 20 and 22). In contrast, Xie et al. perform the first visibility test after the polygons have been sorted and binned. There is no

sorting or binning set required or used in the method disclosed in the application. Thus, one fundamental difference in the method of the present application and the Xie et al. patent is the order of operations. More particularly, the present application describes a method involving an order of computing geometry (Geometry processor), first visibility test, store visible polygons to occlusion data buffer, second visibility test. Xie et al., by contrast, involves Geometry processor, binning, store all polygons to tiles, 1st visibility test, 2nd visibility test.

As Applicants stated previously, visibility tests 1 and 2 by Xie et al. essentially are parts of the same visibility tests, and not separate tests because they are performed subsequently. A significant innovation described in the present application is the occlusion data buffer *between* visibility tests 1 and 2 to allow more hidden polygons to be occlusion culled at visibility test 2.

For instance, claim 1 recites processes of "storing occlusion data of the visible primitives for a next comparison based in said first visibility test ... computing the occlusion data for each visible primitive ... collecting said primitives to an occlusion data buffer." That is, the claimed method stores polygons to the occlusion data buffer between visibility tests 1 and 2, whereas the HZ buffer described by Xie et al. stores depth information constructed from the Z-buffer (see, lines 10-12 of column 3). Therefore, the buffers of the present invention and Xie are clearly not analogous. The present application describes the low-resolution Z-buffer separately, as can be seen in Figure 2. This buffer stores per-pixel information and as also seen in Figure 2, the occlusion data buffer stores the visible polygons after the first visibility test.

The next recited step in claim 1 is "testing the visibility of the collected primitives in a second visibility test with said computed occlusion data." As clearly set forth in the claim language, the second visibility test is performed after the first visibility test and *after* storing

visible polygons to the occlusion data buffer. Xie et al., on the other hand, performs the second visibility test right after the first visibility test.

On page 4, section 7, the Examiner asserts: "Xie et al. does not use the explicit language 'collecting said stored primitives to an occlusion data buffer'; however, one of ordinary skill in the art would recognize that the polygons are stored in the z-buffer analogous to an occlusion culling data buffer from the statement in lines 51-53 of column 13: '... rendering polygons in the scene in depth order, starting with the closest polygon, and storing them in a Z-buffer...'." To the contrary, a Z-buffer does not store polygons. Rather, a Z-buffer stores per-pixel depth-values for all pixels of the polygon. This is described in Xie et al. in lines 28-31 of column 2. The occlusion data buffer of the present invention stores the complete polygon description.

For at least these reasons, the Xie et al. patent does not describe the claimed subject matter within the purview of Section 102. As such this rejection should be withdrawn.

Claims 2-8 depend from claim 1, and are therefore allowable at least for the above reasons, and further for the addition separately patentable features recited. For example, claim 2 recites the process of discarding hidden primitives of the first visibility test. In connection with this feature, the Examiner asserts that lines 66-67 of column 4 of Xie et al. discloses discarding any polygons determined to be occluded by the HZ buffer test. However, Xie et al. discard occluded primitives after first storing them into bins and performing the first visibility test. The present invention, by contrast, performs the first visibility test, discards the occluded primitives and only stores the visible primitives to the occlusion data buffer (see, Figure 2).

Dependent claim 3 recites "storing Z values to an occlusion fusion cache while computing occlusion." With respect to this feature, the Examiner refers to lines 16-19 and

21-22 of column 5, and asserts that one of ordinary skill in the art would recognize that the HZ buffer 100 of Xie et al. "is analogous to the occlusion fusion cache recited in claim 3, as the statements on lines 44-50 of column 5 and the equation on line 51 of column 9 show the HZ buffer stores occlusion data computed from the values of the Z-buffer." However, the hierarchical Z-buffer (HZ) described in Xie et al. (Figure 4) is a multi-level Z-buffer, while a low-resolution Z-buffer consists of only one level. The present invention does not describe nor claim that the low-resolution Z-buffer would consist of any hierarchy. Also, the HZ buffer is not a cache of Z-values, whereas occlusion fusion cache is. The occlusion fusion cache stores minimum and maximum depth values for each pixel in an 8x8 pixel block, as described in lines 26-33 of page 8 of the specification. Hence, the HZ buffer and the fusion cache are not analogous.

With respect to dependent claim 5, which recites that after the visibility test, collecting a predefined amount of occlusion data of the primitives to the occlusion data buffer, the Examiner refers to the "tiles" described in lines 29-32 of column 2, column 4, lines 60-63; and column 8, lines 61-65. However, a tile described by Xie et al. and the occlusion data buffer described by the present application are not analogous. Xie et al. describes in column 4, lines 52-54 that tiles are constructed by sorting polygons of the scene. No such sorting is claimed. Instead, claim 1 recites how visible polygons, after the first visibility test, are stored to a single occlusion data buffer, while the method used by Xie et al. requires use of multiple "tiles." Also, Xie et al. does not disclose that a preferred amount of data would be stored to the tiles (or bins).

Further, given the method performed by Xie et al., this reference would not include all of the components of Applicants' claimed system set forth in claim 9. Accordingly, it is respectfully submitted that Applicants' claimed invention as set forth in claims 1-5, 7-12 and

14-18 clearly distinguish over the teachings of Xie et al. and are in proper condition for allowance.

The final action also maintains the rejection of claims 6 and 13 under 35 U.S.C. §103(a), as allegedly being unpatentable over Xie et al. in view of Fowler et al. However, the Fowler et al. patent does nothing to overcome the aforementioned shortcomings associated with the teachings of Xie et al., for reasons provided in Applicants' March 28, 2006, response.

In view of the forgoing, it is respectfully requested that the Examiner reconsider and withdraw the pending rejections without further delay, that claims 1-18 be allowed and the application passed to issue.

Respectfully submitted,

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